Claims

1. A dry powder inhaler for delivering a dose of medicament for inhalation by a user, the dose being contained in a medicament pack having a puncturable lid, the inhaler comprising a drug entrainment device including a drug outlet tube terminating with a primary piercing element to pierce an opening in said lid when a pack is located in the inhaler, a secondary piercing member to pierce a plurality of peripheral openings in said lid and, an airflow path to enable the supply of a charge of gas into the pack via said peripheral openings to scour the interior of a pierced pack such that substantially all of the dose is entrained in the gas and flows out of the pack via the drug outlet tube.

2. An inhaler according to claim 1, wherein the drug outlet tube is in communication with means for aerosolising the drug entrained in the gas for inhalation by a user.

3. An inhaler according to claim 2, wherein the aerosolising means is a nozzle having a substantially circular cross-section with a substantially tangential inlet port from the drug feed tube and substantially axial exit port.

4. An inhaler according to any preceding claim, wherein the airflow path comprises an annular conduit in the drug entrainment device that surrounds the drug outlet tube.

5. An inhaler according to any preceding claim, wherein the drug entrainment device includes an airflow inlet for the flow of air from the airflow path into a plenum chamber formed in a space between the drug entrainment device and a lid of a pierced pack mounted in the inhaler, the inlet and the plenum chamber being configured such that a swirling airflow is generated in the plenum chamber above the lid of a pierced pack.

6. An inhaler according to claim 5, wherein the plenum chamber is substantially cylindrical in shape and the inlet intersects the curved wall of the chamber at a tangent thereto such that the air flows into the plenum chamber in a direction substantially parallel to the lid of a pierced pack.

7. An inhaler according to any preceding claim, wherein the drug entrainment device comprises a housing and the primary piercing element and secondary piercing member protrude from an end face of said housing such that said end face forms a seal around the periphery of the lid of a pack when said primary piercing element and secondary piercing member pierce said lid.

8. An inhaler according to claim 7, wherein said plenum chamber is partially formed from a recess in said end face.

9. An inhaler according to any preceding claim, wherein the secondary piercing member is mounted on the drug feed tube.

10. An inhaler according to any preceding claim, wherein the secondary piercing member is configured to form a substantially circular pattern or ring of openings in the lid of a blister.

11. An inhaler according to claim 10, wherein the secondary piercing member comprises an annulus with a plurality of cutting teeth depending from the periphery thereof.

12. An inhaler according to claim 11, wherein each tooth has two cutting edges of equal length that converge towards a pointed tip.

13. An inhaler according to claim 12, wherein the cutting teeth are angled away from the axis of the annulus by angle of between 30 and 60 degrees.

14. An inhaler according to claim 13, wherein the secondary piercing member is formed from a sheet of material and the teeth are bent out of the plane of the sheet.

15. An inhaler according to claim 5 or claim 6, wherein the secondary piercing member is configured to direct the swirling flow of air in the plenum chamber into the pack through the openings formed therein by the secondary piercing member.

16. An inhaler according to claim 15, wherein the secondary piercing member comprises a plurality of blades with a vane depending from each blade for piercing the lid of the pack and for directing the swirling flow of air therein.

17. An inhaler according to claim 16, wherein the vanes have arcuately shaped outer edges.

18. An inhaler according to claim 16 or 17, wherein the blades are located substantially parallel to the lid of a pack that has been pierced and the vanes are deflected out of the plane of the blades towards and into a pack.

19. An inhaler according to any of claims 15 to 18, wherein the secondary piercing member is mounted on the drug outlet tube, the axis of the drug outlet tube being substantially at right angles to the airflow inlet to the plenum chamber such that the airflow generated in the plenum chamber and pack swirls substantially about the axis of the drug outlet tube.

20. An inhaler according to any preceding claim and a medicament pack containing a dose of powdered medicament mountable therein for inhalation by a user using the inhaler, the package comprising a circular blister having a piercable lid.

21. An inhaler according to claim 20, wherein the drug entrainment device and the lid of the blister together define the walls of a substantially cylindrically shaped plenum chamber when the blister is pierced by the drug entrainment device, the plenum chamber including an inlet in communication with the airflow path to enable the supply of a charge of gas into the pack via the plenum chamber and the peripheral openings in the lid, wherein the inlet is configured such that the air flows

into the plenum chamber in a direction substantially parallel to the surface of the lid.

22. An inhaler according to claim 21, wherein the inlet intersects the cylindrical wall of the plenum chamber at a tangent to generate a swirling airflow in the plenum chamber.

23. A medicament pack for use in an inhalation device comprising a drug storage chamber to contain a single dose of medicament and an aerosolising nozzle for generating an inhalable aerosol of the dose for inhalation by a user when a charge of gas is passed through the pack.

24. A medicament pack according to claim 23, wherein the drug storage chamber and the aerosolising nozzle are integrally formed into a single module.

25. A medicament pack according to claim 23 or claim 24, comprising a blister having two compartments forming the drug storage chamber and the aerosolising nozzle respectively, each compartment being sealed with a piercable lid to enable an inhaler to pierce an inlet for the gas in the dose storage chamber and an outlet for the aerosolised dose in the aerosolising nozzle.

26. A medicament pack according to any of claims 23 to 25, wherein an integral drug feed path communicates the drug storage chamber with the aerosolising nozzle.

27. A medicament pack according to any of claims 23 to 26, wherein the drug storage compartment and the aerosolising nozzle are integrally formed from a moulded plastics material which is sealed with a piercable lid to enable an inhaler to pierce an inlet for the flow of gas into the dose storage chamber and an outlet for aerosolised dose in the aerosolising nozzle.

28. A medicament pack according to any of claims 23 to 26, wherein the drug storage compartment and the aerosolising nozzle are integrally formed from a

moulded plastics material which is sealed with a piercable lid to enable an inhaler to pierce an inlet for the flow of gas into the drug storage chamber, an aperture being formed in the moulded plastic to form an outlet for the dose from the aerosolising nozzle.

29. A medicament pack according to any of claims 23 to 28, comprising a sheet in which is formed a plurality of drug storage chamber and nozzle pairs.

30. A medicament pack according to any of claims 23 to 28, comprising a sheet in which is formed a single nozzle and a plurality of drug storage chambers, a drug feed path connecting each of the drug storage chambers with the nozzle.

31. A medicament pack according to any of claims 26 to 30, wherein the nozzle is a substantially cylindrical vortex chamber and the inlet from the drug feed tube intersects the chamber at a tangent.